swarm lying in its track, and it is quite possible that the brightening of the comet at the time of the discovery was very sudden, thus explaining why the comet was not detected earlier.

The Rev. E. M. Searle (*Astronomical Journal*, No. 283) has deduced a period fifteen days shorter than that of Mr. Boss.

M. Schulhof, of Paris, finds a period of 6·909 years. He also points out that among the known periodic comets that of De Vico shows the greatest orbital similarity to Holmes's comet, and he considers that they may possibly have a common origin.

Mr. Roberts, of the Nautical Almanac Office, accepting as real the supposed impression of the comet obtained by Mr. Schorling in a photograph of the region taken on October 18, found a period of fifteen years, but the general agreement of the latest computations seems to indicate that the image in question could not be that of the comet.

The comet is now so dim that it is not considered necessary to continue the ephemeris.

EPHEMERIS OF COMET BROOKS (November 20, 1892).—The following ephemeris of Comet Brooks (Berlin, midnight) is given in *Ast. Nach.*, No. 3140, by Kreutz :—

Date.	R A. h. m. s.	Decl. (app.) ° ′	Log *r*.	Log Δ.
Jan. 12	21 40 18	+ 59 41	0·0786	9·8915
13	56 4	58 8·1	0·0791	9·9012
14	22 9 53	56 33·6	0·0797	9·9114
15	22 3	54 59·1	0·0803	9·9220
16	32 47	53 25·7	0·0810	9·9330
17	42 18	51 54·2	0·0818	9·9442
18	50 47	50 25·2	0·0826	9·9556
19	22 58 23	48 59·3	0·0835	9·9670

THE METEOR SHOWER OF NOVEMBER 23, 1892.—Further observations of this fine display of shooting stars are recorded in *Astronomical Journal*, No. 283. Prof. J. K. Rees counted 165 meteors in half an hour, and noted some as bright as Mars; all of them were very swift. The Rev. J. G. Hagen estimated that one observer, with a clear view to the west would have seen 250 meteors in half an hour, and notes that some were as bright as Jupiter. Mr. Sawyer estimated the maximum frequency as about 300 per hour, and, strangely enough, describes them as "slow-moving, generally quite bright, although none were observed as bright as the planets Mars and Jupiter." Both Prof. Rees and Mr. Sawyer note that the meteors appeared in clusters, four or five falling almost at the same instant, while for a few minutes none were seen. The radiant was near γ Andromedæ, and there is little doubt that the shower was that due to Biela's comet.

GEOGRAPHICAL NOTES.

IN M. Dybowski's journey from the Mobangi to the Shari, as described at a recent meeting of the Paris Geographical Society, he encountered one of the most systematically cannibal tribes which has yet been described. This tribe, known as the Bonjos, have only one object of purchase—slaves to be eaten. They refuse to sell food or any other products of their country for anything else, and the surrounding tribes capture and export canoe-loads of slaves for this purpose. The French expedition experienced great difficulty in obtaining food amongst a people who had no desire for ordinary articles of trade.

THE boundaries of the republics of South and Central America are certainly the least definite lines on the political map of the world so far as civilized lands are concerned. The question of delimitation is never at rest. Dr. H. Polakowsky gives in the last number of *Petermann's Mitteilungen* a brief account of the negotiations and surveys relating to the frontier of Costa Rica and Nicaragua from 1858 to 1890. The difficulty in this case lies in the fact that the mouth of the San Juan river, a certain point of which was fixed on in 1858 as the coast frontier, is continually changing, and a breakwater belonging to the harbour and canal entrance of Greytown, in Nicaragua, now stands in what was formerly the territory of Costa Rica. On the Pacific coast years of diplomacy were required to fix the centre of Salinas Bay, but it is satisfactory to know that permanent boundary stones have now been erected at both ends of the line.

MR. COLES delivered his second lecture to young people under the auspices of the Royal Geographical Society, on Friday evening, when a large audience of both young and old enjoyed his spirited descriptions of Iceland and British Columbia, illuminated by many anecdotes of personal adventure.

THE defective condition of the charts, even of the coast of Europe, was strikingly brought out by the recent court-martial on the stranding of H.M.S. *Howe* in Ferrol Channel. The chart used on board was drawn from soundings made about a hundred years ago, with a few subsequent corrections, which failed altogether to indicate the rock on which the *Howe* struck. The Spanish authorities are reported to have refused permission for the new chart surveyed by the officers of the Channel Squadron to be published, and meanwhile the Hydrographic Office has cancelled the old chart.

A NEW SEISMOGRAPH.

BEFORE speaking of this memoir, let me enter a protest against the method of publishing these "Annali" in such a way as to convey the impression that the papers composing it were written three years before their actual date. All readers are warned that when the volume is bound up, and the paper covers are removed, they must post-date the papers by three years.

The seismograph described in the present paper is intended for stations of the second class. The objects in view in its construction were amplification of the record in a pendulum seismograph, and improvement of the warning apparatus in the form of a style seismoscope of the Milne type which the author finds frequently fails.

The amplifying lever is composed of fine placfont tubes arranged girder-like in the form of a short hollow triangular prism, surmounted by an acute triangular pyramid, which points downwards, and carries at its apex the writing style. The pendulum bob is a flattened cylinder, supported by a placfont wire 1·50 m. long. The amplifying lever at the junction of the three pyramidal and the prismatic tubes supports three radial arms meeting in the centre, as it were, of the pyramid base, and support a ball-and-socket joint of agate, the cup part of which is at the end of an arm projecting from the supporting wall. Immediately above this centre, and occupying the prism space of the lever, is the cylindrical box, the wire supporting which passes through a small hole in the centre of the base of the prism. We thus have a simple lever of the first order of light girder work. It is prevented from rotating in azimuth by including some steel wire permanently magnetized.

The style has been modified by lightening it and making it more rigid and non-oxidizable, which is done by using a capillary glass tube.

The registering apparatus is a smoked glass plate, supported over a clock, started at the moment of the earthquake by a seismoscope. To prevent the complex figures of the ordinary registration in a pendulum seismograph, the author has arranged so that the plate shall rotate through a segment of a circle every three seconds, so as to bring a fresh surface of smoked glass beneath the style.

Some modifications are then described. The principal one is making the bob annular, carrying a suitable aperture, in which is engaged the short end of a lever. This lever is composed of three very thin brass tubes, graduating away smaller from the fulcrum, which is a gimbal joint such as suggested by the reviewer some years since in NATURE. This lever carries at its lower and longer end the style which records on the glass plate as in the original one described in this memoir.

Another modification is a combination of the triple and single suspension of the pendulum bob, that is, the bob ring is first suspended by triple wires to a button which in its turn hangs at the end of a single wire.

The details of these seismographs are fairly well worked out, but the employment of aluminium in many of the parts has been neglected. Likewise, no arrangement has been made for the oblique play of the engaged pinion in the newer lever. The only new point about this seismograph is the interrupted rotation of the recording plate. This has a decided advantage in giving a dissected record, but is part counterblanced by the fact that important movements that may be taking place at the moment

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[1] G· Agamennone, "Sopra un Nuovo Pendolo Sismografico." *Annali dell' Ufficio Centrale Meteor. e Geodinamico*, ser. sec., pt. 3, vol. xi., 1889. (Roma, 1892.)

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of the advance are represented by a curve or curves which would require a series of careful experiments to be carried out in each instrument, followed by difficult and elaborate calculation for each advance.

Much credit is due to the author for working out the modifications, but until we have some original method of finding a steady-point, not so far suggested, it is doubtful if we can improve on the Gray, Ewing, and Milne seismographs, that are not, as the author imagines, little used or tested instruments.

H. J. JOHNSTON-LAVIS.

PHYSICAL GEOGRAPHY AND CLIMATE OF NEW SOUTH WALES.

A SECOND edition of an excellent pamphlet on the "Physical Geography and Climate of New South Wales," by Mr. H. C. Russell, F.R.S., astronomer royal for New South Wales, has just been issued at Sydney. It is published by authority of the New South Wales Government. The following extracts may be of interest to various classes of readers in Great Britain :—

Looking back through the pages of history, and the dim traditions of an earlier time, we find abundant evidence of a belief in the existence of a great south land to the south and east of what was then the well known earth. Those early navigators whose travels had fostered this belief, had doubtless followed down the Malay Peninsula and the string of islands which seem to form part of it, in search of spices and other treasures which the islands supplied. Pliny, who had evidently gathered up the traditions of "Terra Australis incognita," says that it lay a long way south of the Equator, and in proof of this mentions the fact, strange in those days, that when some of its inhabitants were brought to civilization they were astonished to find the sun rise on their left hand instead of on their right. And Ptolemy, A.D. 170, after describing the Malay Peninsula, says: Beyond it, to the south-east, there was a great bay in which was found the most distant point of the earth ; it is called "Cattigara," and is in latitude $8\frac{1}{2}^{\circ}$ south ; "thence (he goes on to say) the land turns to the west, and extends an immense distance until (as he believed) it joins Africa." And it may fairly be assumed that the extreme south latitude of Cattigara, and its situation in a great bay where the land turns to the west until it joins Africa, is proof that it was some point in the Gulf of Carpentaria, for no other place would fulfil the conditions. The idea that the land actually reached Africa was not Ptolemy's ; it was a necessary part of the system of Hipparchus, for he taught that the earth surrounded the water and prevented it from flowing away. It is not surprising, therefore, that the early navigators, following down the islands, came at length to that part of the Gulf of Carpentaria where the land turned to the west ; and believing Hipparchus' system of geography, thought that in turning to the west they were in reality turning towards home, and Cattigara was therefore the most distant point known. Marco Polo tells us that the Chinese navigators in his day (A.D. 1293) asserted there were thousands of islands in the sea to south of them, and in the present day we find proofs of their early visits to Australia in the traces of Chinese features amongst the natives of the northern coast ; indeed, some historians think that Marco Polo, in the account he gives of the expedition sent to Persia by the Great Khan, refers directly to Australia, under the name of Lochac. This place he says was too far away to be subjugated by the Great Khan, and was seldom visited ; but it yielded gold in surprising quantity, and amongst other wonders contained within it an immense lake or inland sea. It is impossible that such a description should apply, as has been thought, to the Malay Peninsula,—a country within easy reach, and one which his ships must have passed in every voyage ; and so far from being beyond his power, it was within the limits over which his sway extended. That Lochac formed part of the main-land was also quite in accordance with their ideas of the earth, which surrounded the ocean, and the abundance of gold is certainly more likely to be true of Australia than of the Malay Peninsula.

For long years after Marco Polo we find no direct reference to Australia, except the stories which lived amongst navigators, and seemed to lose none of their marvellous points by transmission. These kept alive the desire to explore the great south land, so rich in treasures and wonders. All the evidence collected so far goes to prove that the Portuguese had, early in the sixteenth century, explored at least the northern parts of Australia. What they learned was, however, kept a profound secret until about 1540, when one of their government maps was stolen ; and there are now in existence six maps believed to be copies of it, which were all published between 1539 and 1555. These all show Australia under the name of the "Land of Java," the real Java being called the "Little Java," and from this time onward frequent attempts were made to explore what had for so many generations been "Terra Australis incognita." Sturdy navigators could not understand the silence of the Portuguese, except as proof of the richness of the land, about which tradition told wonderful tales. "It was a land of gold and spices, of magnificent tropical fruits and vegetation—a perfect paradise, in which the happy and simple inhabitants were loaded with jingling ornaments of gold. Its very atmosphere was elixir, and existence a round of enjoyment." No wonder that in an age when, at least upon the ocean, the power to take was mistaken for the right to do so, there were many who cast longing glances towards the southern Paradise. Whether these stories of gold had any foundation in fact or not, when barter was regularly exchanged on the coast of Australia, it is impossible now to say, but more recent discoveries of rich surface gold lend some colour to them, and the vegetable richness of the northern part of Australia is quite in accordance with tradition. But all the early English navigators were unfortunate, and Australia got a reputation the very reverse of what further investigation has shown that it deserves. In point of fact, all the glowing colouring of tradition is true ; but when Dampier, in 1688, sailed down the western coast, he saw nothing but a "dry sandy soil," and the "miserablest people in the world" ; and later on, when the first English settlers landed on Australia, they chose a bay, beautiful to look at, but there was no gold and no fruit worthy of the name, the soil was barren and sandy, and the climate in the worst part of its summer. No wonder that the fame of Australia was blackened, and report made it a miserable land, subject to droughts and floods—a land in which everything was turned topsy-turvy. The summer came at winter time ; trees shed their bark, not their leaves—were brown instead of green ; the stones were on the outside of the cherries ; and the pears, pleasant to look at, were only to be cut with an axe ; and there was nothing to eat, "unless, perchance, ye'l fill ye with root of fern or stalk of lily." Such was the early verdict upon Australia. Fortunately the first colonists, once here, were obliged to stop. By degrees they found that everything that was planted grew well ; that wheat in the valley of the Hawkesbury yielded 40 to 50 bushels to the acre, and in one memorable season actually ruined the farmers by its very abundance, for in the then limited market, the price fell so low that it was not worth gathering, and it was left in the fields to rot, while the farmers sought other work. Horses, sheep, cattle, and pigs throve marvellously, and some of the cows getting away, the bush soon contained numbers of wild cattle. Even wool did not deteriorate in the new Colony ; and step by step the facts became too strong for prejudice, and the first fleeces of Australian sheep sent to England lifted the veil. Manufacturers would gladly take as many as could be sent ; their demand for more wool extends with the supply, and now only from Australia can they obtain the fine wools which they need. Quantity and quality of wool have increased together, and the Grand Prize at the Paris Exhibition for our New South Wales wool has proclaimed the fact far and wide. Wool has done still more for the Colony. We took possession of it as a narrow strip of coast country ; the demand for pasture forced us to find a way over a hitherto impassable range, and the same want has driven all the desert out of the Colony, and covered it with sixty-two millions of valuable sheep (1892). The country which early writers upon Australia called a barren waterless desert is now growing the finest wool and yielding abundant water from wells, and when, in 1851, it was announced that gold had been discovered in abundance, the world was convinced that Australia was a promising country after all. Year by year the people have been coming in increasing numbers to supply our great want (population), and as our numbers increase new avenues of wealth and prosperity are opening before us.

Geographically, Australia has a grand position, lying between the 10th and 40th degrees of south latitude—that happy mean where it is neither too hot nor too cold. Surrounded by the ocean, the sea breezes temper what might otherwise be a hot climate in the summer ; the air is clear and dry, and yet brings rain in heavy showers. Vegetation is abundant, and includes

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